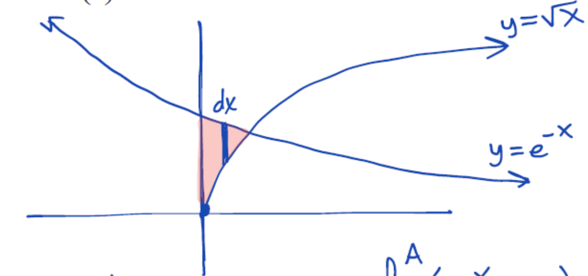
7. (Calculator Permitted) Let R be the region bounded by the graphs of $y = \sqrt{x}$ $(= y1)$, $y = e^{-x}$ $(= y2)$, and the y-axis.

give them specific names based on how you enter them into your calculator!

(a) Find the area of R.



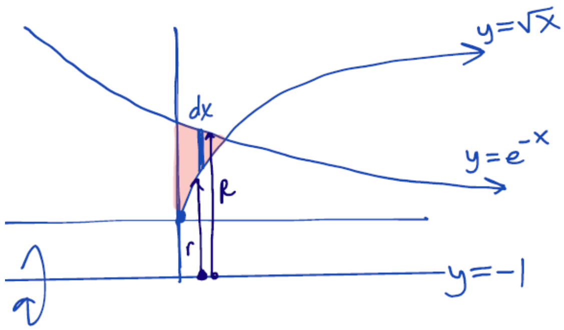
intersect
$\sqrt{x} = e^{-x}$
$x = 0.426 = A$ (store as A)

$$\text{Area} = \int_0^A \left(e^{-x} - \sqrt{x}\right)dx$$

or $= \int_0^A (y2 - y1)\,dx$

$= 0.161$ or 0.162

(b) Find the volume of the solid generated when R is revolved about the line $y = -1$.



PerpenWASHular

$$V = \pi \int_0^A \left[\left(e^{-x} + 1\right)^2 - \left(\sqrt{x} + 1\right)^2\right]dx$$

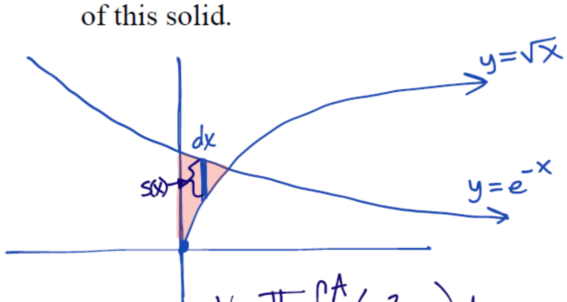
($R = e^{-x}+1$, $r = \sqrt{x}+1$)

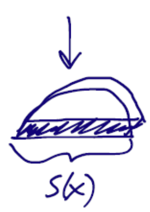
or

$$V = \pi \int_0^A \left[(y2+1)^2 - (y1+1)^2\right]dx$$

$V = 1.630$ or 1.631

(c) The region R is the base of a solid. For this solid, each cross section perpendicular to the x-axis is a semicircle whose diameter runs from the graph of $y = \sqrt{x}$ to the graph of $y = e^{-x}$. Find the volume of this solid.





$$V = \frac{\pi}{8}\int_0^A \left(s^2(x)\right)dx$$

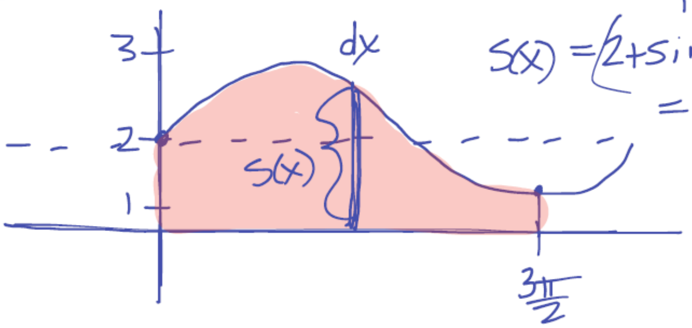
Magic Number for semi-circles ($\frac{\pi}{8}$)

$$V = \frac{\pi}{8}\int_0^A \left(\left(e^{-x} - \sqrt{x}\right)^2\right)dx$$

or $V = \frac{\pi}{8}\int_0^A \left((y2 - y1)^2\right)dx$

$V = 0.034$ or 0.035

(Calculator Permitted) The base of the volume of a solid is the region bounded by the curve $y = 2 + \sin x$, the x-axis, $x = 0$, and $x = \frac{3\pi}{2}$. Find the volume of the solids whose cross sections perpendicular to the x-axis are the following:



T − B

$S(x) = (2+\sin x) - (0)$

$= 2 + \sin x = y1$ ← put S(x) into y1 and label it y1 on paper!

(a) Squares

$V = \int_0^{3\pi/2} (2+\sin x)^2\,dx$

$V = \int_0^{3\pi/2} S^2(x)\,dx$

$= \int_0^{3\pi/2} (y1)^2\,dx$

$V = 25.205$

(b) Rectangles whose height is 3 times the base

$V = \int_0^{3\pi/2} (3S(x) \cdot S(x))\,dx$

$V = 3\int_0^{3\pi/2} S^2(x)\,dx$

$V = 3\int_0^{3\pi/2} (y1)^2\,dx = 75.617$

(c) Equilateral triangles

$V = \int_0^{3\pi/2} \frac{\sqrt{3}}{4} S^2(x)\,dx$

$V = \frac{\sqrt{3}}{4}\int_0^{3\pi/2} y1^2\,dx$

$V = 10.914$

(d) Isosceles right triangles with a leg on the base

$V = \int_0^{3\pi/2} \left(\frac{1}{2}S(x) \cdot S(x)\right) \cdot dx$

$V = \frac{1}{2}\int_0^{3\pi/2} S^2(x)\,dx$

$V = \frac{1}{2}\int_0^{3\pi/2} y1^2\,dx$

$V = 12.602$

(e) Isosceles triangles with hypotenuse on the base

$V = \frac{1}{4}\int_0^{3\pi/2} S^2(x)\,dx$

$V = \frac{1}{4}\int_0^{3\pi/2} y1^2\,dx$

$V = 6.301$

(f) Semi-circles

$V = \frac{\pi}{8}\int_0^{3\pi/2} S^2(x)\,dx$

$V = \frac{\pi}{8}\int_0^{3\pi/2} y1^2\,dx$

$V = 9.898$

(g) Quarter-circles

$V = \frac{\pi}{4}\int_0^{3\pi/2} S^2(x)\,dx$

$V = \frac{\pi}{4}\int_0^{3\pi/2} y1^2\,dx$

$V = 19.796$